



# State of Louisiana Coastal Protection and Restoration Authority

## 2019 Short Summary Report

for

## Sabine Refuge Marsh Creation Cycles – 3-4-5

State Project Number CS-28  
Priority Project List 8

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Cameron Parish

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2019 Operations, Maintenance, and Monitoring Report  
For  
Sabine Refuge Marsh Creation (CS-28)

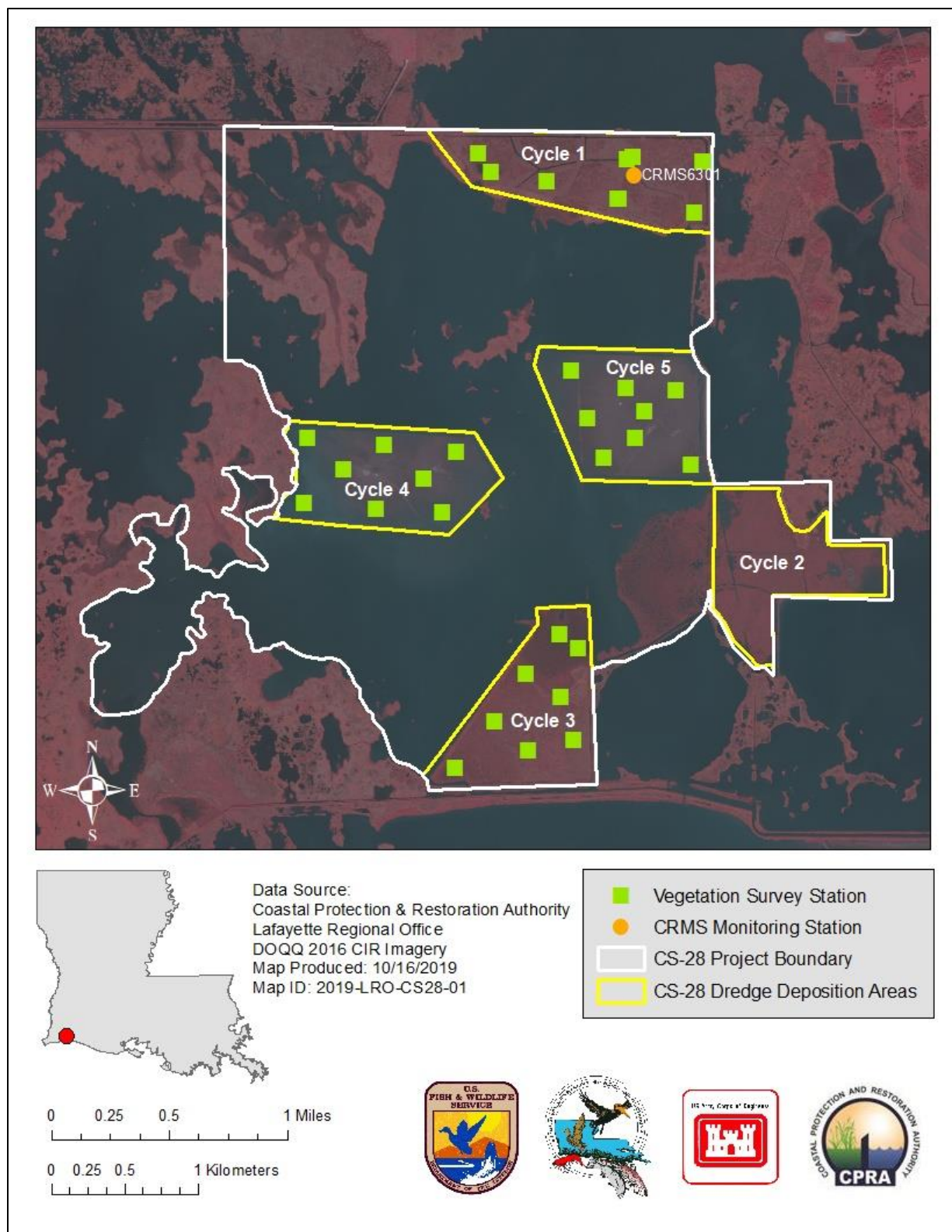
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## **I. Preface**

The Sabine Refuge Marsh Creation Cycles 3-4-5 Project (CS-28) 2019 short summary report includes monitoring data collected through December 2018.

This report is intended to update USFWS and USACOE on the latest land change, vegetation and elevation change data. The 2019 report is the 5th report in a series of OM&M reports on CS-28 Cycles. For more detailed analysis, see the previous comprehensive OM&M reports (2005, 2007, 2011 and 2014) online at (<http://lacoast.gov/new/Projects/Info.aspx?num=CS-28-1> or CS28-2, CS-28-3 or CS-28-4-5). Future reports are planned 2021, 2025, 2031 and a comprehensive OM&M report is planned for 2034.



**Figure 1:** Sabine Refuge Marsh Creation (CS-28) project area boundary, deposition area boundaries, vegetation monitoring stations, and CRMS site.

## II. Monitoring Activity

Pursuant to a CWPPRA Task Force decision on August 14, 2003 to adopt the CWPPRA Coastwide Reference Monitoring System-Wetlands (CRMS-Wetlands, updates were made to the CS-28 Monitoring Plan to merge it with CRMS-Wetlands and provide more useful information for modeling efforts and future project planning while maintaining the monitoring mandates of CWPPRA. CRMS06301 was constructed in the Cycle 1 dredge deposition area. No CRMS-Wetlands sites are located within the Cycle 3-4-5 project areas.

### a. Monitoring Goals

The Sabine Refuge Marsh Creation (CS-28) project is classified as a marsh creation project. Land area and vegetation is expected to increase with the addition of dredge filled containment cells. Through the use dredge material pumped from the Calcasieu Ship Channel into multiple containment cells, land area and vegetation will increase and marsh degradation will decrease. The project has been broken into 7 cycles of which 5 cycles have been completed.

The objectives of the Sabine Refuge Marsh Creation Project are:

1. To create new vegetated marsh.
2. Enhance and protect existing surrounding marsh vegetation.

The specific measurable goals established to evaluate the effectiveness of the project are:

1. Place dredge spoil slurry to a maximum height of 4.5 ft (1.4 m) MLG (2.29 ft Geoid 12A NAVD88) to settle to a height of 2.5 ft (0.8 m) MLG, (.29 ft Geoid 12A NAVD 88) after five years, for each of five dredging cycles.
2. Create 125 acres (50 ha) of vegetated wetlands in the first dredge placement cycle and 230 acres (93 ha) in each of Cycles 2 through 5.
3. Reduce the loss of existing surrounding marshes within the project area.

Goals 1-3 will be assessed in this report

### b. Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

#### Aerial Photography

Near-vertical color-infrared aerial photography (1:24,000 scale) was used to measure vegetated and non-vegetated areas for the project and reference areas. The photography was collected in December, 2009 and December, 2015 after construction of Cycles 3-4-5 (Figure 2-3). The original photography was checked for flight accuracy, color correctness, and clarity and was subsequently archived. Aerial photography was scanned, mosaicked, and georectified by USGS/NWRC personnel according to standard operating procedures (Steyer et al. 1995, revised 2000). The

land/water estimates for 2015 were done using 1 meter resolution CIR (color-infrared) digital orthoimagery. The 2015 land water estimates were done for each cycle independently to show replicable changes over time within each of the cycles.

### **Emergent Vegetation**

In Cycle 3, eight vegetation stations were established in 2008 and were monitored in 2010, 2012 and 2018. In Cycles 4 and 5 eight vegetation stations were established in 2018 and were monitored in 2018. Two 2 m<sup>2</sup> plots were sampled at each of the stations. Percent cover, height of dominant species, and species richness were quantified. Ten reference stations were established in the pre-existing, reference marshes in the northwest corner of the project area (Figure 1).

### **Elevation Survey**

Cycle 3 contains elevation monitoring surveys conducted in August 2013 and October 2018. Cycles 4 and 5 contain an elevation monitoring survey conducted in October 2018. Future replicable surveys are expected 2023.

## **c. Monitoring Results and Discussion**

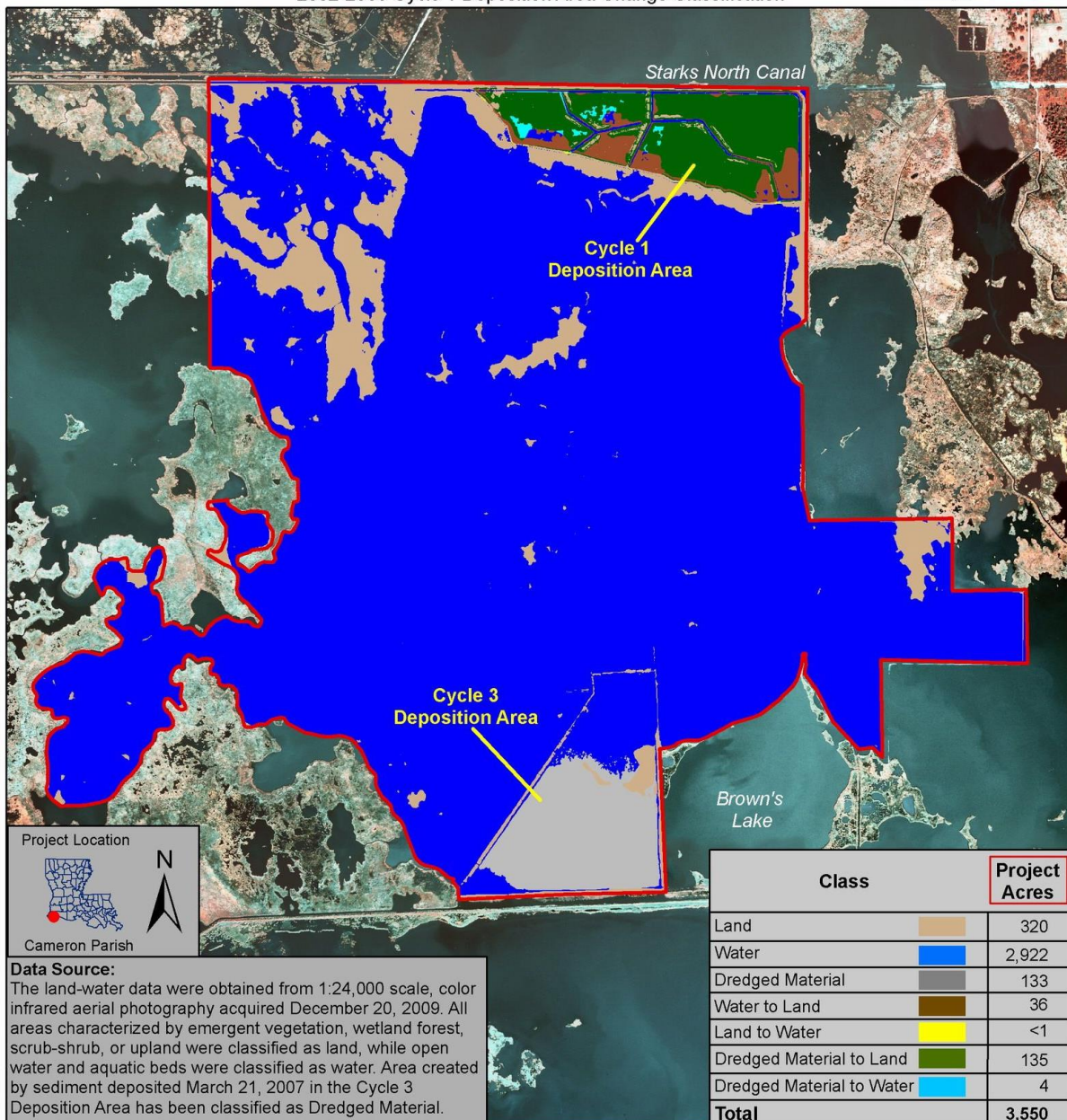
### **i. Land Change**

Land/Water photography was captured and analyzed in 2002, 2009 and 2015 (Figures 2 and 3). Due to the CS-28 cycles 3,4 and 5 being constructed after 2002, only the 2009 and 2015 analysis will be used.

In 2009 the Cycle 3 area contained 132 ac (59.2%) of dredge material and 10 ac (4.5%) of existing land compared to 218 ac (97.8% )of vegetated land in 2015. The northern portion of cycle 3 which was too deep for plant colonization in 2009 had become completely colonized by 2105 which created 86 acres of new vegetated marsh (Figure 3).

Cycle 4 contained 68 ac (29.8%) of land and 160 ac (70.2%) of water in 2015 and Cycle 5 contained 148 ac (63.8%) of land and 84 ac (36.2%) of water. The cycle 4 area has settled to a lower elevation than cycles 3 and 5 (Figure 10) and is mostly water along the South, East and Western perimeters of the cell (Figure3). It is anticipated that the area will fill in over time just as Cycle 3 area did. The cycle 5 area is mostly water towards the west but is expected to expand westward as vegetation and sediments nourish the area (Figure 3).

The project is achieving its goals of creating land and appears to be preventing land loss in adjacent marshes. The long term coupling of channel dredging and beneficial use of dredged material within the CS-28 project areas and nourished areas will allow for continued marsh creation cells in the future.



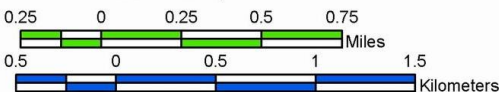
Disclaimer: Provisional Data Subject to Revision

**Prepared by:**

U.S. Department of the Interior  
U.S. Geological Survey  
National Wetlands Research Center  
Lafayette, Louisiana  
and

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Lafayette Field Office

Scale = 1:30,000

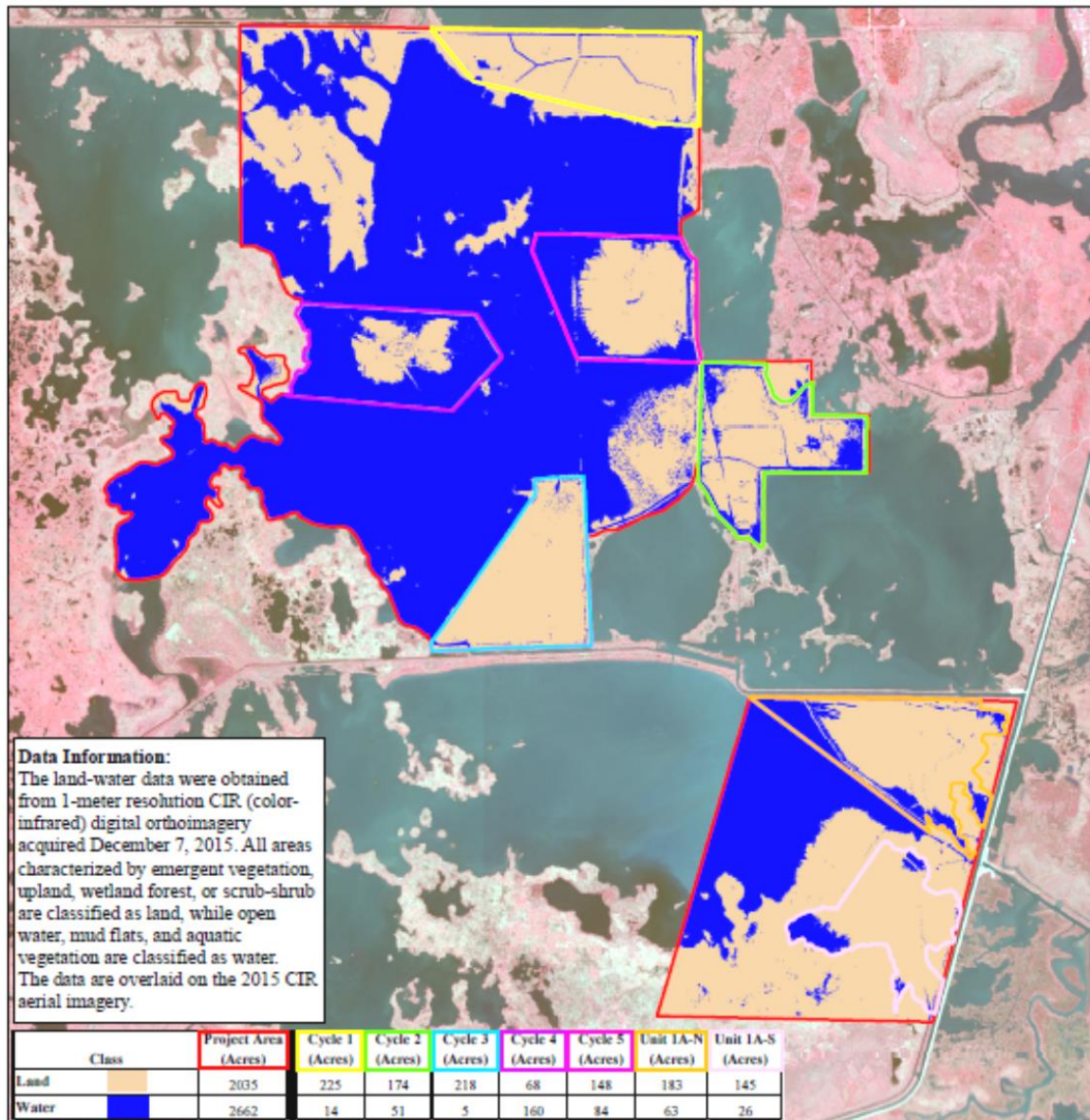


Federal Sponsor:  
U.S. Army Corps of Engineers



Map ID: USGS-NWRC 2011-02-0006

**Figure 2.** Land:Water classification from photography obtained in December 2002 and 2009.



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U.S. Department of the Interior  
U.S. Geological Survey  
Wetland and Aquatic Research Center  
Lafayette, Louisiana and  
Coastal Protection and Restoration Authority of Louisiana  
Lafayette Regional Office  
Federal Sponsor: U.S. Fish and Wildlife Service

Scale = 1:40,000  
0 0.5 1 Miles  
0 0.5 1 Kilometers



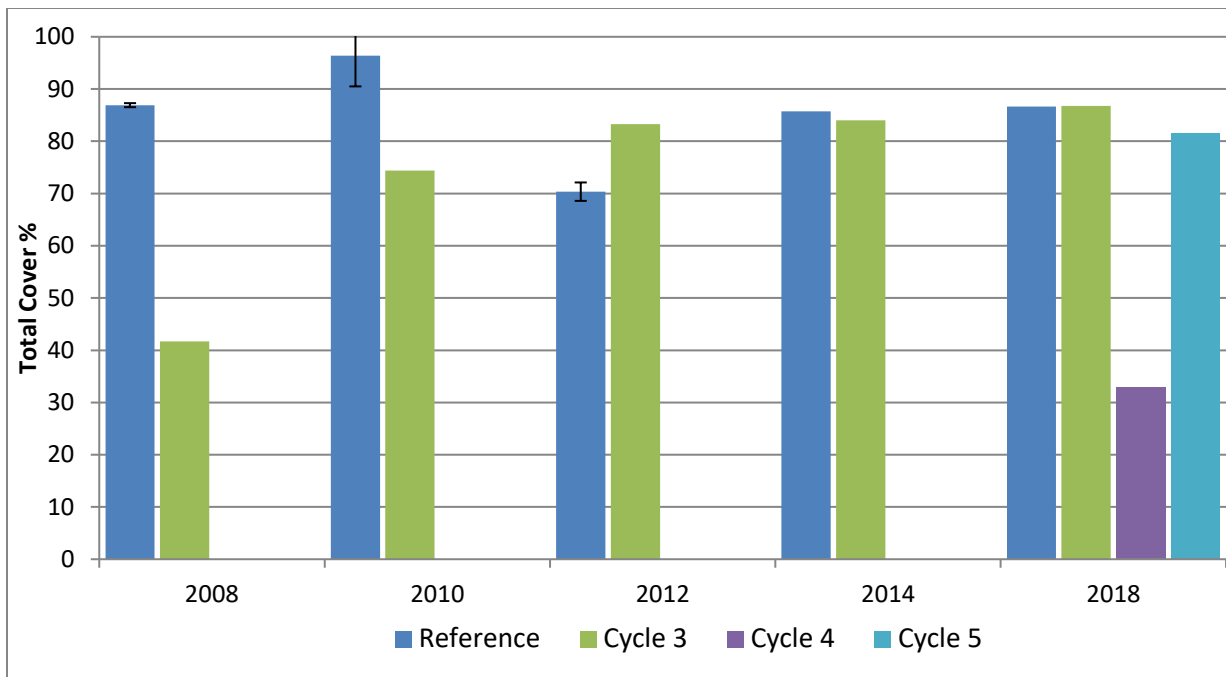
DOI: 10.5066/P95K89ZU

**Figure 3.** Land:Water classification from photography obtained in December 2015.

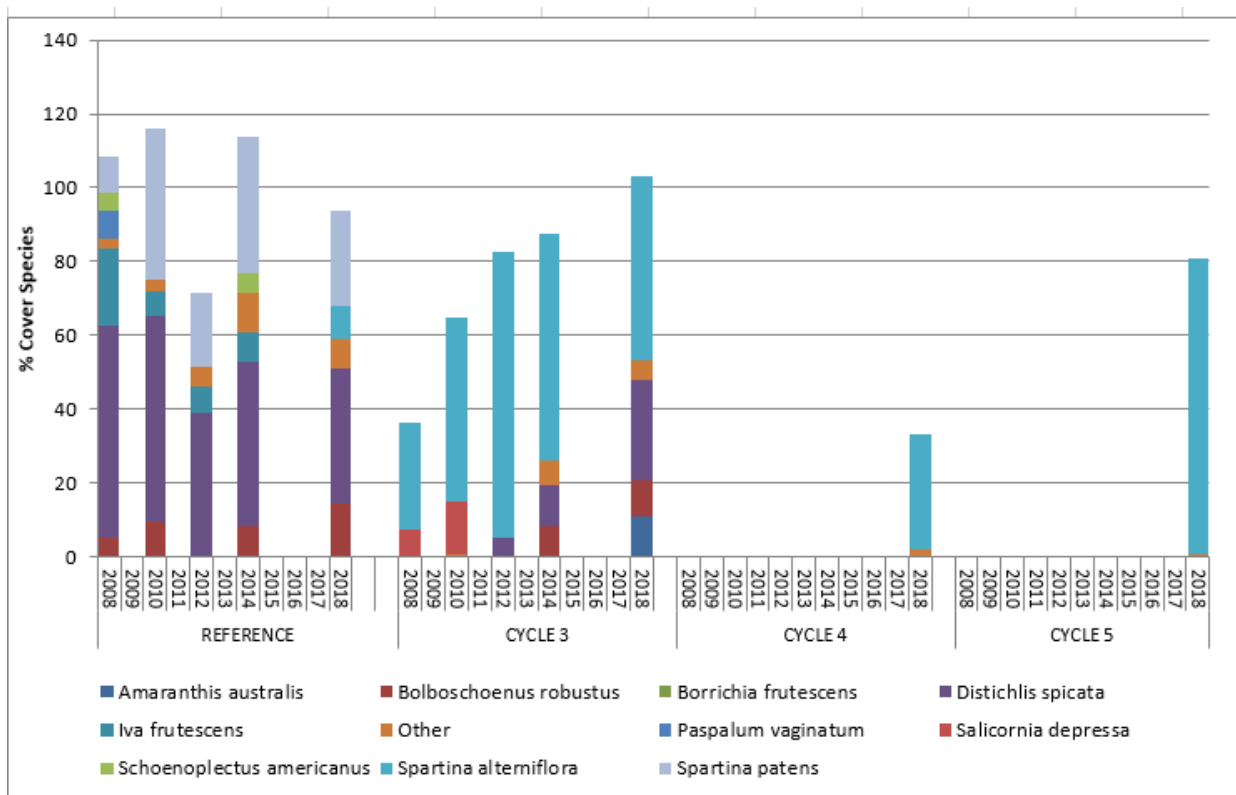
## ii. Emergent Vegetation

Cycle 3 was constructed in 2007 and had begun to vegetate on the southern end with a 41.6% vegetative cover in 2008 but still had open water areas on the northern end. Vegetation crept northward within the flooded area in 2010 and percent vegetation cover increased to 74.4%. The vegetation cover stabilized around 84.0% in years 2012, 2014 and 2018 which was equal to the percent cover within the reference area (Figure 4). Cycles 4 and 5 were sampled for the first time in 2018. Cycles 4 and 5 had 32.8% and 81.4% cover respectively. Cycle 4 has a higher elevation in the middle of the disposal site which is less flooded and more suitable to vegetative growth, and a lower more flooded elevation around the East, West and Southern edges. The lower flooded areas are likely causing the decrease in percent cover of vegetation. Cycle 5 has a higher more tidal elevation throughout most of its eastern cell, causing a higher percent cover in vegetation species (Figure 4).

The species assemblage in Cycle 3 during 2008 (3 years after construction) was very similar to the initial species found within Cycles 4-5 during 2018 (3 years after construction). Cycles 3, 4 and 5 were essentially a monoculture of *S. alterniflora* after initial pumping although Cycle 3 had some stands of *Salicornia depressa* until 2010. (Figure 5). The assumption that the Cycles would vegetate from seed appears to have been correct. No plantings have been installed within Cycles 4-5. Currently Cycle 3 has the most diverse plant community with 4 species but it is lacking the presence of *Spartina patens*. Cycles 4 and 5 contain only *Spartina alterniflora* as of now (Figure 5). It will take a long time for the dredged cycles to be as diverse as the reference area, but it will be interesting to see whether the natural community that develops in the older Cycles will eventually mirror the vegetative community present in the existing reference marsh.



**Figure 4.** Total percent cover of emergent vegetation by years within CS-28 cycles 3, 4, 5 and reference area. Mean  $\pm$  SE.



**Figure 5.** Percent cover of individual vegetation species by years within CS-28 cycles 3, 4, 5 and reference area

### iii. Elevation

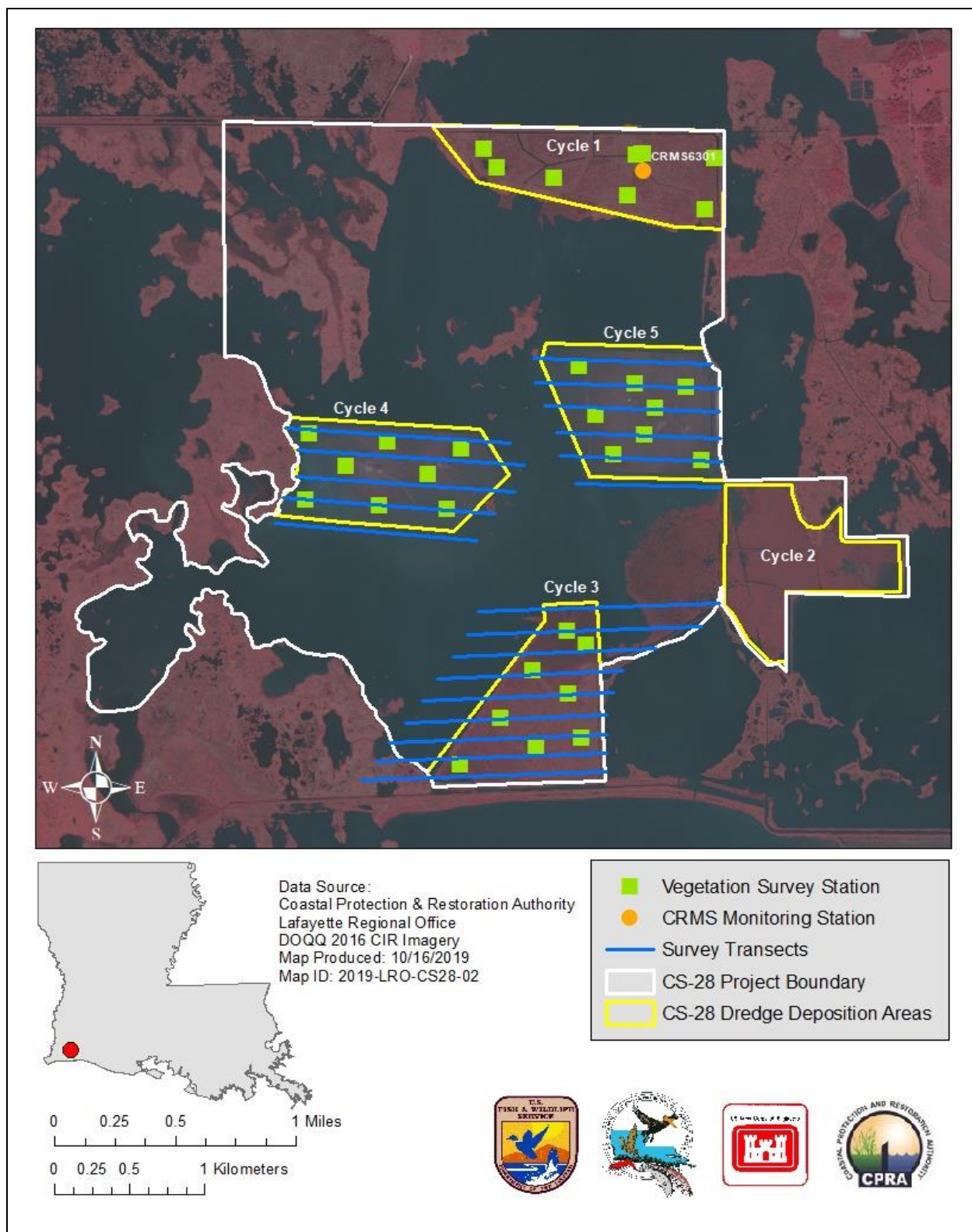
The goal for each of the cycles was a settled marsh elevation of 2.5 ft MLG (.29 ft NAVD88 (Geoid 12A)) after 5 years (Figure 6). Elevations were taken along 9 transects within Cycle 3 in 2013 and 2018 and along 5 transects within cycles 4 and 5 in 2018 (Figures 7-9). Elevation data was collected in NAVD 88 (Geoid 12A) to compare across years.

Cycle 3 was measured to be between -2.03 and .80 NAVD 88 (Geoid 12A) in the 2013 survey at year 6 (Figure 10). The Cycle 3 area is below the target elevation in the northern 3 of 9 transects (T1, T2 and T3) surveyed in 2013 (Figures 7 and 10). The low elevations are linked to the shallow, unvegetated open water areas in the northern end of the project area.

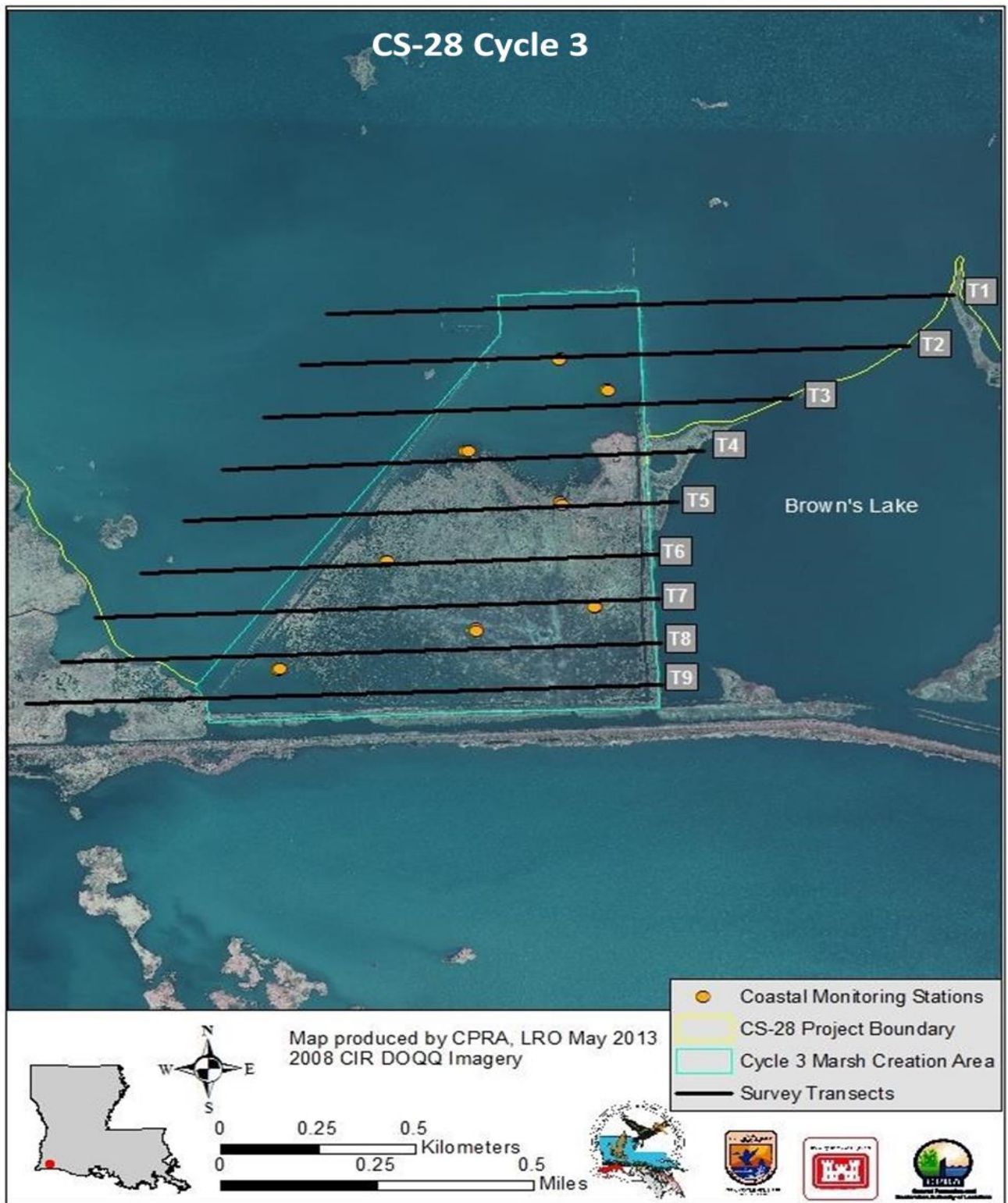
The 2018 survey has shown that Cycle 3 now has only 2 transects (T2, T3) on the northern end that are now slightly below the target elevation (Figure 10). The shallow, unvegetated open water areas have now become mostly vegetated with a higher elevation which can be seen in the 2015 land-water classification (Figure 3) and elevation survey (Figure 10).

The cycle 4 and 5 surveys were taken at year 3 after completion. The Cycle 4 cell has settled to an elevation of 0.52 (C4-T1) to 0.30 (C4-T4) ft NAVD 88 (Geoid 12A) which is at or above target elevation. The transect C4-T5 was taken outside of the cycle 4 cell to capture overflow benefits and had an elevation of -0.63 ft.

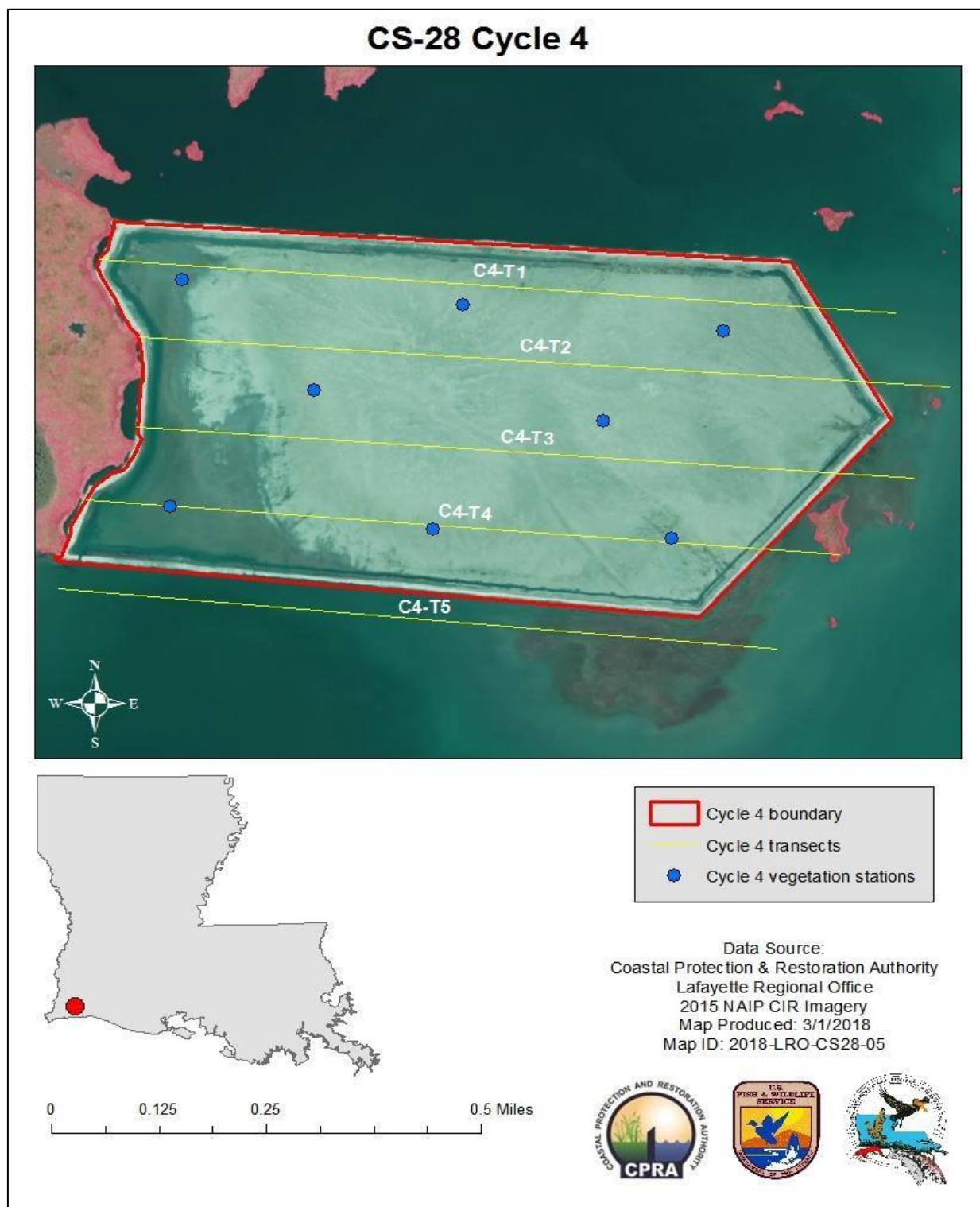
Cycle 5 has settled to an elevation of 0.85 (C5-T3) to -0.39 (C5-T5) ft NAVD 88 (Geoid 12A). The target elevation of 0.29 ft was reached at 3 of the 5 transects. The 3 transects (C5-T1, C5-T2 and C5-T3) had elevations from 0.69 to 0.85 ft and were much higher than target elevations (Figure 10). Additional settlement is expected to occur but it is likely that the cell was pumped to a higher elevation on the northern end. The transects C5-T4 and C5-T5 (Figure 9) had elevations of 0.00 and -0.38 ft respectively (Figure 10). Elevations are expected to increase over time as vegetation migrates southward as was seen in Cycle 3.



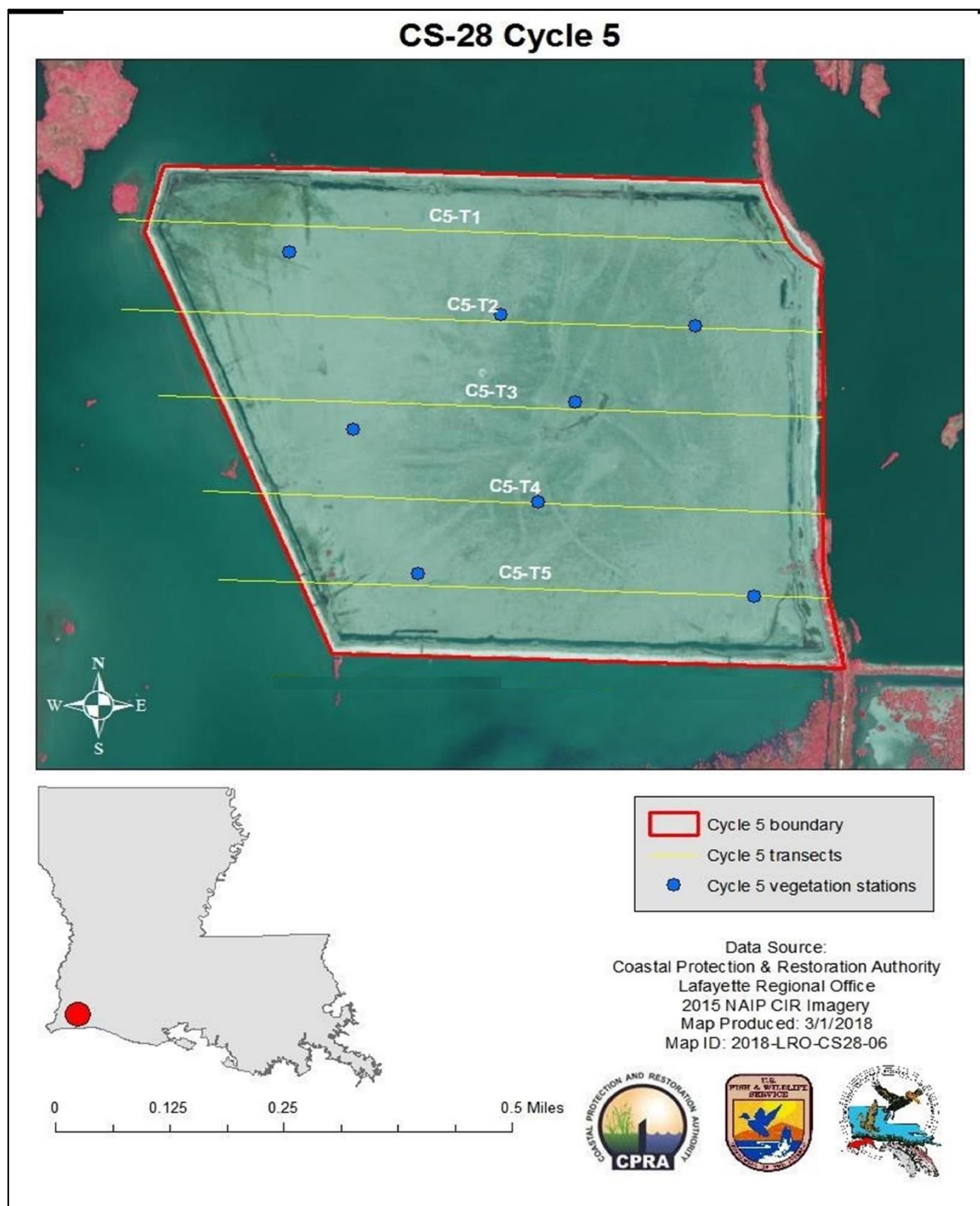
**Figure 6.** Survey transects, vegetation monitoring stations and project area boundary of the Cycle 3,4 and 5 deposition ares.



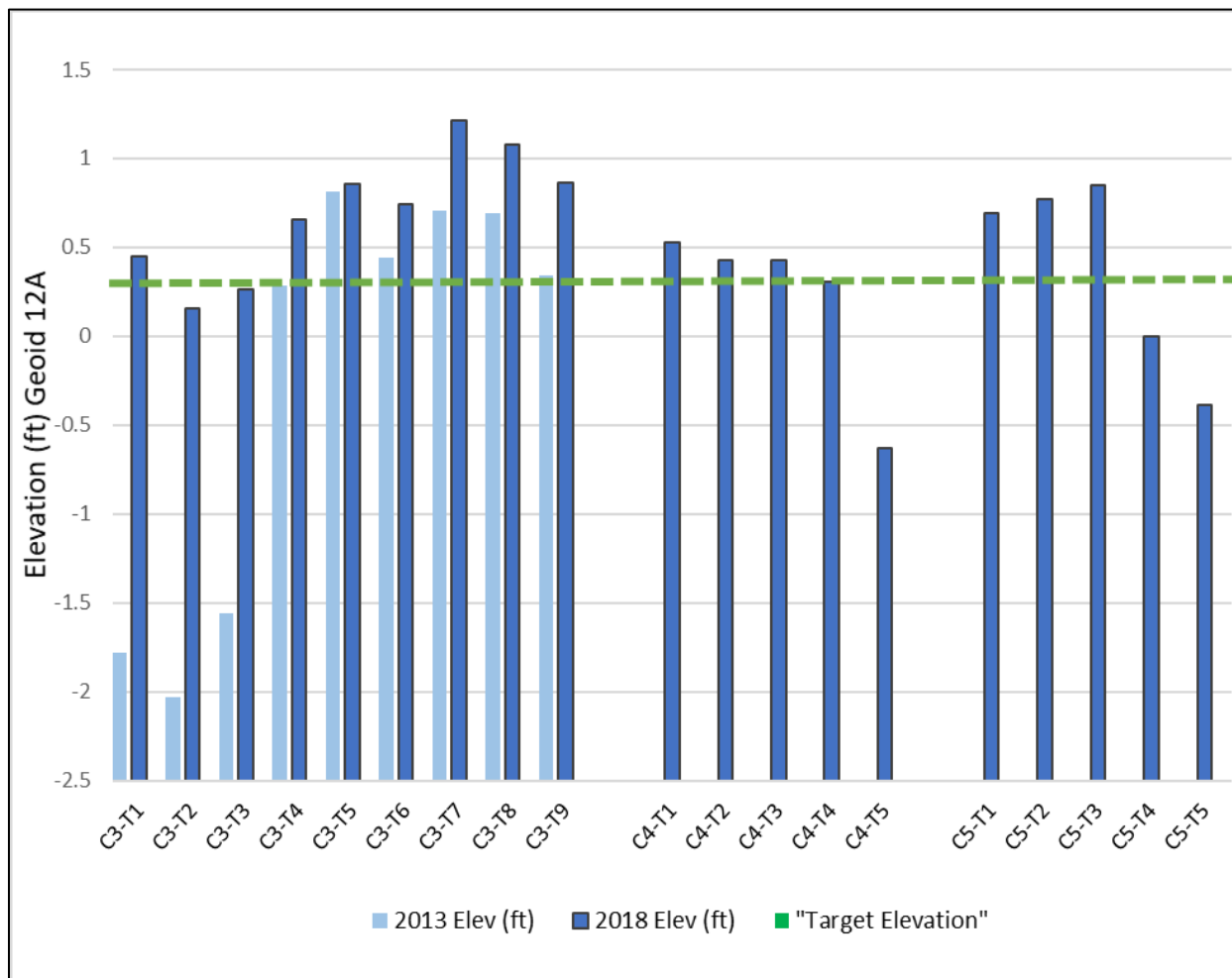
**Figure 7.** Survey transects, vegetation monitoring stations and marsh creation boundary of the Cycle 3 deposition area in 2008.



**Figure 8.** Survey transects, vegetation monitoring stations and marsh creation boundary of the Cycle 4 deposition area in 2015.



**Figure 9.** Survey transects, vegetation monitoring stations and marsh creation boundary of the Cycle 5 deposition area in 2015.



**Figure 10.** Survey elevation data and target elevation from 2013 and 2018 for Cycles 3,4 and 5 deposition areas.

### **III. Conclusions**

#### **a. Project Effectiveness**

The major objective of the Sabine Refuge Marsh Creation Project is to create new vegetated marsh and to enhance and protect existing surrounding marsh vegetation. To date 365 acres have been created in Cycle 3 and up to 230 acres have been created in Cycles 4 and 5 with additional acres created from spillover. Each of the cycles should help protect the area from saltwater intrusion. The specific goal of creating marsh that settles to 2.5 ft MLG (.29 ft NAVD88 (Geoid12A) has been achieved in Cycles 3 and 4 (Figure 10). The Cycle 4 transect line C4-T5 which has a low elevation was done outside of the containment cell to measure overflow. Cycle 5 has reached the target elevation at 3 of the 5 transects. The transects that have the lowest elevation are located on the southern end of the containment cell (Figure 10). As vegetation migrates southward, the Cycle 5 elevation is expected to increase as it did within Cycle 3.

#### **b. Recommended Improvements**

No improvements are currently being recommended.

#### **c. Lessons Learned**

Dredge containment cells near the Browns Lake area, within the Sabine National Wildlife Refuge will vegetate without the addition of vegetative plantings. The Cycle 3,4 and 5 areas have vegetated as quickly as the planted Cycle 1 area and did so from seed bank alone. It is not necessary to pre-dig trenasses for tidal ingress and egress. Rather, the track hoe/marsh buggy can be driven over the area where tidal channels are desired approximately one-three years after pumping to create channels. Pre-digging trenasses is costly and can interfere with the placement of the dredged material.

Post-construction as-built surveys should be conducted on the dredge material cycles at pre-determined intervals. The surveys should be replicable and should include a design that is cost effective and aids in determining settlement rates over time within each cycle.

#### **IV. Literature Cited**

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